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Three Temperate-Water Species of South African Gastropods Recorded for the First Time in Southwestern Australia

by

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Abstract. Three temperate South African species of gastropods (*Nassarius kraussianus, Bullia annulata,* and *Cymatium cutaceum africanum*) are recorded for the first time in southwestern Australia. Possible mechanisms by which these species were able to transmigrate the Indian Ocean are discussed.

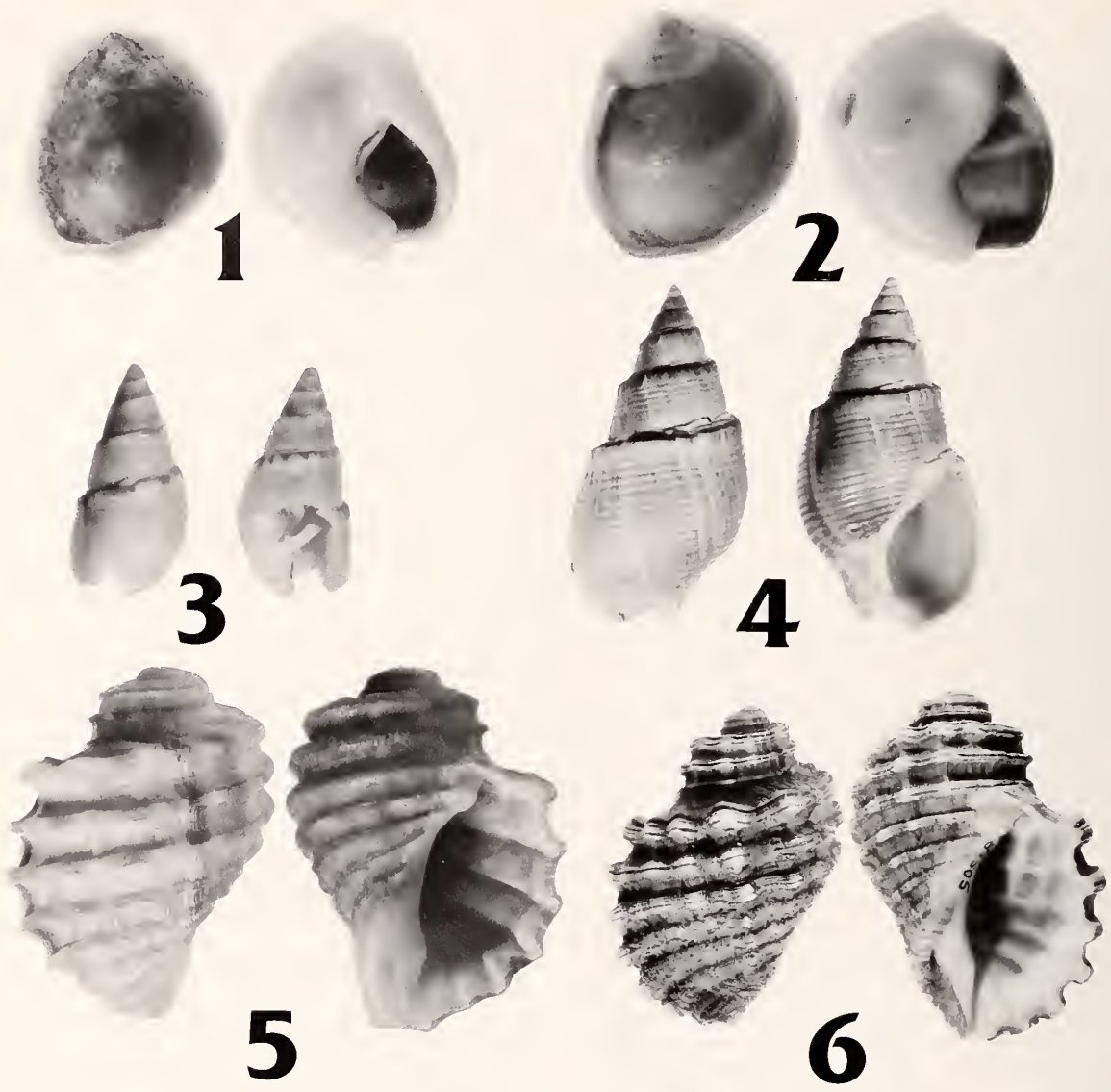
INTRODUCTION

THE TEMPERATE waters of southern Africa and southern Australia are in distinct biogeographic regions (BRIGGS, 1975). Aside from a few circumtemperate species there are few mollusk species in common between southern Africa and southern Australia, as a comparison of species included in WILSON & GILLETT (1979) and KILBURN & RIPPEY (1982) shows. A number of mollusk species have been shown to have crossed the Pacific (EMERSON, 1967; VON COSEL, 1977) and Atlantic (SCHELTEMA, 1971) oceans. Only two temperate species of mollusks are known to have crossed the southern Indian Ocean. The southern African abalone *Haliotis spadicea* Donovan, 1808 (=*H. sanguinea* Hanley, 1840) has been collected in southern Western Australia at Cowaramup Bay, south of Cape Naturaliste (MACPHERSON, 1953). The southern Australian muricid *Bedeva paivae* (Crosse, 1864) has recently established itself in East London Harbour (KILBURN & RIPPEY, 1982) and also in the Canary Islands (GOMEZ, 1984). Three additional southern African temperate species have now been recorded in southern Western Australia and are reported here.

SOUTH AFRICAN SPECIES

Nassarius kraussianus (Dunker, 1846) has been recorded as two lots. WAM 51-82 (Figure 1) is an adult shell 7.7 mm long, which was collected dead at Augusta, W.A., by W. Anson in January 1974. The shell has the thick, glossy callus that overlaps the sides and reaches the apex, as described by KILBURN & RIPPEY (1982). The shell is smooth dorsally, has three grayish-brown spiral bands on the body whorl separated by whitish bands. A thin brown line occurs along the suture. The outer shell color shows through the aperture. The callus is white, with a thin brown line going posteriorly from the posterior edge of the aperture. Two specimens, one an adult 7.8 mm long and the other a juvenile of 5.4 mm, were collected dead by G. Hansen at Flinder's Bay, Augusta, W.A., on 2 July 1972 (WAM 2670-83). These shells closely resemble the specimen described above, except that the juvenile shell lacks the callus. A specimen of *N. kraussianus* from Durban, South Africa, is shown (Figure 2) for comparison.

A single beachworn specimen of *Bullia annulata* (Lamarck, 1816) was collected dead by W. Anson at Flinder's Bay, Augusta, W.A., on an unknown date, about the same time as the *Nassarius kraussianus* was collected. This specimen (WAM 52-82) is a juvenile shell that is 23.8 mm long, but the lower aperture is broken off (Figure 3). Despite being broken this specimen closely matches specimens from the Cape (NM and WAM collections; Figure 4). The Western Australian shell is not as heavy as the South African one but has the same stepped whorls, shallow spiral grooves, and faint growth lines. The shell is



Explanation of Figures 1 to 6

Figure 1. *Nassarius kraussianus* (Dunker, 1846) from Augusta, W.A. WAM 51-82.

Figure 2. *Nassarius kraussianus* (Dunker, 1846) from Durban, South Africa. WAM 50-82.

Figure 3. *Bullia annulata* (Lamarck, 1816) from Flinder's Bay, Augusta, W.A. WAM 52-82.

Figure 4. *Bullia annulata* (Lamarck, 1816) from False Bay, Muizenberg, South Africa. WAM 2672-83.

Figure 5. *Cymatium cutaceum africanum* (A. Adams, 1854) from Augusta, W.A. WAM 54-82.

Figure 6. *Cymatium cutaceum africanum* (A. Adams, 1854) from Nthlonyane, Transkei, South Africa. WAM 2671-83.

buff colored, with distinct brown splotches just below the suture. The aperture is white.

A single juvenile individual 19.7 mm long of *Cymatium cutaceum africanum* (A. Adams, 1854) was collected dead at Augusta, W.A., by W. Anson on 27 or 28 January 1979 (WAM 54-82). This species is discussed in detail by KILBURN & RIPPEY (1982) and is quite variable in South Africa, but the Western Australian specimen fits easily into the range of variation observed in the species (Figures 5, 6). The Western Australian shell has a low spire, narrow umbilicus, and strong spiral cords—seven on the body whorl and two on the upper whorl. The spiral cords are crossed by several indistinct ribs and numerous fine growth lines. The spiral cords appear on the inside of the aperture as channels that extend onto the lip. The shell is a light brown and the aperture is whitish.

DISCUSSION

There are several points of similarity between the coastal environments of eastern South Africa and Western Australia. Both coasts show a parallel transition between a temperate-water fauna in the south and a tropical fauna of predominantly Indo-West Pacific incursives in the north (Wells, 1980; Kilburn & Rippey, 1982). Although many such tropical species are common to both sides of the Indian Ocean, the respective temperate-water molluscan faunas are very different, apart from certain tonnacean gastropods with teleplanic larvae (see Beu, 1976) which have been dispersed at various times since the Oligocene by the Westwind Drift, and circumtemperate species. Environmental factors of temperature, salinity, and topography are not dissimilar. For example, mean summer temperatures along most of the southern Cape coast (the center of distribution of all four species) are 19–20°C (Christensen, 1980), which agrees with those of southern Western Australia (Hodgkin & Phillips, 1969). Physical factors may thus support the colonization of the region by South African migrants.

However, no direct evidence yet exists for the presence of established, viable populations of *Nassarius kraussianus, Bullia annulata* or *Cymatium c. africanum* in southern Western Australia. *Nassarius kraussianus* inhabits estuaries and salt marshes in South Africa (Kilburn & Rippey, 1982). The site at Augusta, W.A., where the species was found is near the mouth of the Blackwood River, but two surveys of the estuary (Wallace, 1975; Wells & Threlfall, 1981) did not record the species. *Bullia annulata* in South Africa is washed up in sheltered bays and lives in sand at low tide, but is most abundant subtidally at depths of up to 100 m, and *C. c. africanum* lives among solitary ascidians offshore, under rocks at low tide or on sand near ascidians (Kilburn & Rippey, 1982). *Haliotis spadicea* was recorded by Macpherson (1953) as occurring alive near Cape Naturaliste in Western Australia. The Western Australian Museum conducted fieldwork in the Augusta to Cape Naturaliste area in January 1978 and April 1985 and failed to find living colonies of any of the South African species. Nor have local shell collectors reported additional finds of South African species, alive or dead, in Western Australia. Thus, the four species known to have crossed the southern Indian Ocean from South Africa to Western Australia appear to have arrived in small numbers and have not become established.

The mechanism by which these species reached Western Australia is not known, but the literature suggests several possibilities: dispersal by pelagic larvae (Scheltema, 1971), rafting on algae on the sides or in the ballast water of ships or on floating logs (Smith, 1890; Clench, 1947), on the feet of birds (Kew, 1893), or in the gut of fishes. Although the reproductive mechanism of *C. c. africanum* is not known, other cymatiids have long distance planktonic larvae that are able to cross open oceanic areas (Scheltema, 1971). *Nassarius kraussianus* is ovoviviparous with a planktonic veliger stage of a week or less (Kilburn & Rippey, 1982). Species of *Bullia* in which reproduction has been studied have either direct development (Brown, 1982) or ovoviviparity (Kilburn, 1978). *Haliotis* have a planktonic stage of about one to two weeks (Ino, 1952; Leighton, 1972). Thus, none of these three species is likely to have arrived in southern Western Australia by means of a planktonic larval stage, but just how they arrived has not yet been determined.

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